



FOREST PEST MANAGEMENT

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A Diagnosis and Forecast of Tree Mortality on the Tahoe National Forest

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ABSTRACT

Tree mortality on the Tahoe National Forest has been rising steadily since 1987 -- first in the mid to upper elevation red and white fir and more recently in pine -- such that by fall, 1989, mortality was severe and widespread. While bark beetles, in association with various diseases and site and stand conditions, are the most visible agents associated with the mortality, it is moisture stress due to 4+ years of precipitation deficit that is the primary or underlying cause. Soil moisture conditions have not improved during winter of 1989-90, indicating that tree mortality will continue through 1990 at the same high or, perhaps, even higher level as that experienced in 1989. Salvage, for utilization purposes, is the most appropriate action indicated, but salvage will not prevent additional trees from dying. Improved soil moisture to relieve moisture stress is the only area-wide remedy to the current situation and the earliest that will occur, if it does, is the winter of 1990-91.

INTRODUCTION

Elevated tree mortality in the central Sierra Nevada was observed as early as fall of 1987. Since then it has increased in extent and severity such that by fall of 1989, the mid to upper elevation fir on the Plumas National Forest (Milford and Beckwourth Ranger Districts) in the north, to the Sierra National Forest (Mariposa Ranger District) in the south, uniformly showed well above normal levels of mortality. Tree mortality in the pine component of the mixed conifer type too began to rise in the fall of 1987, but not at the same pronounced rate observed in fir.

In October, 1989, entomologists John Wenz, and Bruce Roettgering accompanied Forest and District personnel to several timber stands on the Sierraville, Truckee and Nevada City Ranger Districts. The purpose of the trip was to observe tree mortality, diagnose the causes for it and to forecast the trend of mortality into summer and fall of 1990. In November, John Wenz participated in an aerial survey of the Tahoe National Forest to observe the level and distribution of tree mortality. Forest and District personnel made a similar flight in early March, 1990.

OBSERVATIONS

Tree mortality in the mid to upper elevation white and red fir has been ongoing and at an accelerating rate since at least 1987. The most apparent agent associated with the mortality is the fir engraver, Scolytus ventralis. Almost always, one or more additional factors can be directly tied or strongly suggested as part of a mortality complex, to include advanced tree/stand age; overstocking; and dwarf mistletoe, root disease, and cytospora canker infections. In pine, bark beetles, namely pine engravers, Ips spp. and the mountain pine beetle, Dendroctonus ponderosa, in sugar pine; the Jeffrey pine beetle, D. jeffreyi, in Jeffrey pine; and the western pine beetle, D. brevicornis, in ponderosa pine, are the most visible agents associated with tree mortality. But again, as in fir, additional factors such as overstocking and dwarf mistletoe and root disease infections often are directly tied, as part of a mortality complex, to the mortality.

The primary contributing factor underlying all of the tree mortality, however, is moisture stress due to precipitation deficit or erratic pattern since 1985. Moisture stress acts as an abiotic disease which weakens trees, predisposing them to beetle attack.

FORECAST

Observations in the fall of 1989 in stands throughout the central Sierra Nevada showed high levels of recent and current tree mortality (well to freshly faded tree crowns), plus a large cohort of dead trees with crowns not yet faded. These same conditions were observed on the Tahoe National Forest in October 1989. As temperatures rise this spring, the crowns of the trees that were dead in the fall will fade, thus showing the full complement of the 1989 tree mortality.

Conditions have not improved over the winter to suggest a downturn in tree mortality in 1990. Instead, the abundance of favorable bark beetle habitat, due to continued moisture stress and associated disease and unfavorable stand conditions, plus the current high resident beetle populations indicate that tree mortality will occur at the same level or, even higher, as that experienced in 1989.

Given the multiple tree and bark beetle species, the complex nature of the site and stand conditions, and the over-riding situation of continuing moisture stress, timely/prompt salvage, to recover as much value as possible, is the most appropriate action indicated. Salvage will not prevent a continuation of the tree mortality and there is no proven, effective means to combat bark beetles over large areas. Improved soil moisture to relieve moisture stress is the only area-wide remedy to the current situation and the earliest that will occur, if it does, is the winter of 1990-91.